REMARKS

By the foregoing Amendment, Claims 16-27 and 38 have been canceled, and Claims 28, 30, 32, 33, 35, 36 and 43 have been amended. Favorable reconsideration of the application is respectfully requested.

Claims 16-25, 27-43, and 45-46 were rejected as being obvious from Offill, in view of Rosemund et al. and Muller et al. Claims 16-25 and 27 are now canceled, and Claims 28 and 36 have been amended. Claim 28 has been amended to recite "a sheet of high tensile strength rigid polyvinyl chloride material having a flexural modulus of approximately 350,000 to 650,000," and Claim 36 has similarly been amended to recite "impregnating a face of a sheet of high tensile strength rigid polyvinyl chloride material having a flexural modulus of approximately 350,000 to 650,000 with a reactive resin that chemically bonds with a curing agent." Offill discloses a flexible liner forming a mechanical lock rather than bonding with a carrier material, as is discussed at column 7, lines 13-20, "so that the flexible liner can remain flexible with respect to and independent from the adjacent wall surface." The use of the flexible liner requires the use of a collapsible, traveling form 42, with a piston 47 and arms 48 and 50 to support the flexible liner while the carrier material is injected over it. It is respectfully submitted that Offill

does not teach or disclose the use of a sheet of high tensile strength rigid polyvinyl chloride material having a flexural modulus of approximately 350,000 to 650,000, and no motivation is provided in Offill for the use of such a sheet of high tensile strength rigid polyvinyl chloride material. Support for the limitation of the flexural modulus of approximately 350,000 to 650,000 can be found in the specification at page 14, lines 9-10, and support for the rigid nature of the sheet of polyvinyl chloride material can be found at page 8, lines 7-9, and page 12, lines 21-23. Further objective support for the rigid nature of the sheet polyvinyl chloride material is shown in the attached excerpt from Modern Plastics Encyclopedia 1984-1985, pages 480 and 481, in which polyvinyl chloride with a flexural modulus of 300,000 to 500,000 is categorized as being "rigid." It is respectfully submitted that Rosemund et al. and Muller et al. also do not teach, disclose, suggest or provide motivation for the use of a sheet of high tensile strength rigid polyvinyl chloride material having a flexural modulus of approximately 350,000 to 650,000, either separately or in combination with Offill.

Claims 26 and 44 were also rejected as being obvious from Offill, in view of Rosemund et al., Muller et al. , and Ranney et al. Claim 26 has been canceled, and it is respectfully submitted that Ranney et al., either separately or in combination with the other references, also does not teach teach, disclose, suggest or provide motivation for the

use of a sheet of high tensile strength rigid polyvinyl chloride material having a flexural modulus of approximately 350,000 to 650,000 as is claimed.

It is respectfully submitted that the structural reinforcement provided by the sheet of rigid polyvinyl chloride material provides unexpected benefits of allowing the liner to be not only self-supporting but also to support the thermosetting material during installation, and to support the completed structure in a manner not suggested or taught in the references cited. It is therefore respectfully submitted that the rejections of the claims on the grounds of obviousness should be withdrawn in view of the claims as now amended.

In light of the foregoing, it is respectfully submitted that the application should now be in a condition for allowance, and an early favorable action in this regard is respectfully requested.

Respectfully submitted,

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DGP/rvw
Encls.:Return Postcard
Excerpt, Modern Plastics Encyclopedia 1984-1985, pages 480 and 481
Version With Markings To Show Changes Made
Request for Three-Month Extension

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Los Angeles, California 90045
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

28. (Twice amended) A load bearing structure having a closed-loop configuration in cross-section defining a predetermined interior, comprising an integrated, chemically continuous composite material having a plurality of regions continuing progressively from an outside of said structure to said interior of said structure, said composite material comprising:

a. a first compositional region comprising a porous, mineral-containing substrate having pores;

b. a second compositional region comprising a thermoset material chemically bonded by silane to, and intermixed with at least some of the mineral and within said pores of said substrate to form a matrix;

c. a third compositional region proximate and interphased with said second compositional region consisting of a thermoset material selected from the group consisting of polyurethane, epoxy and combinations thereof, and including silane;

d. a fourth compositional region proximate said third compositional region

and consisting of polyvinyl chloride having a substantial amount of hydroxyl ions molecularly bonded to some isocyanates; and

e. a sheet of high tensile strength rigid polyvinyl chloride [thermoplastic] material having a flexural modulus of approximately 350,000 to 650,000 proximate to and defining said predetermined interior having a predetermined boundary and a predetermined interior dimensions, said high tensile strength rigid polyvinyl chloride [thermoplastic] material sheet having a tensile strength of at least 2200 pounds per square inch, wherein said high tensile strength rigid polyvinyl chloride [thermoplastic] material and thermoset material are bonded together and to said substrate with sufficient shear strength to transmit and distribute loads on said substrate to said high tensile strength rigid polyvinyl chloride [thermoplastic] material to improve the structural load bearing strength of said load bearing structure.

30. (Amended) The load bearing [integrated composite] structure of Claim 28 in which the rigid polyvinyl chloride material has [thermoplastic material sheet is polyvinyl chloride having] a tensile strength in the range of from 5,000 psi to 10,000 psi.

32. (Amended) The load bearing structure of Claim 28 wherein said first face of said rigid polyvinyl chloride [thermoplastic] material sheet has a surface area, and wherein said integrated composite material further comprises means positioned on said first face of said rigid polyvinyl chloride [thermoplastic] material sheet for increasing the surface area of said first face.

33. (Amended) The load bearing structure of Claim 32 wherein said means for increasing said surface area of said first face comprises ridges raised from said first face, comprising surface areas generally perpendicular to said rigid polyvinyl chloride [thermoplastic] material sheet.

35. (Amended) The load bearing structure of Claim 33 [34] wherein said raised ridges are positioned circumferentially in relation to said conduit.

36. (Twice amended) A method for lining a conduit having a porous substrate surface, the method comprising the steps of:

impregnating a face of a sheet of high tensile strength rigid polyvinyl chloride [semi-rigid thermoplastic] material having a flexural modulus of approximately

350,000 to 650,000 with a reactive resin that chemically bonds with a curing agent;

positioning said sheet of high tensile strength rigid polyvinyl chloride [semi-rigid thermoplastic] material within the interior of said conduit spaced apart from said substrate surface to create a space between said rigid polyvinyl chloride [semi-rigid thermoplastic] material sheet and said substrate surface;

inserting a mixture of a thermosetting material and said curing agent within said space; and

allowing said thermosetting material to bond with said substrate surface, and allowing said face of said rigid polyvinyl chloride [thermoplastic] material to chemically bond with said curing agent of said thermosetting material, wherein said rigid polyvinyl chloride [thermoplastic] material and thermosetting material are bonded together and to said substrate surface with sufficient shear strength to transmit and distribute loads on said substrate surface to said high tensile strength rigid polyvinyl chloride [semi-rigid thermoplastic] material to reinforce said conduit.

43. (Amended) The method of Claim 36, further comprising the step of forming raised ridges on said face of said rigid polyvinyl chloride [thermoplastic] material to increase the surface area of said face.

1 TEXTBOOK

Materials		ASTM test method	Thermoplastic elastomer (Cont'd)							Ure…
			Block copolymers of styrene and ethylene or butylene	Polyurethane						
				Solution coating resins		Molding and extrusion compounds				
						Polyester		Polyether		
	Properties			Polyester	Polyether	Low and medium hardness	High hardness	Low and medium hardness	High hardness	Alpha cellul… filled
Processing	1. Melting temperature, °C. T_m (crystalline)									1. Therm…
	T_g (amorphous)			− 20 to + 16	− 49	120-160	120-160	120-160	120-160	
	2. Processing temperature range, °F. (C = compression; T = transfer; I = injection; E = extrusion)		C: 300-380 I: 350-480 E: 330-380			I: 380-435 E: 370-410	I: 410-440 E: 370-410	I: 350-430 E: 340-410	I: 400-435 E: 380-440	2. C: 275-… I: 290-3… T: 270-…
	3. Molding pressure range, 10^3 p.s.i.		1.5-20			0.8-1.4	0.8-1.4	0.6-1.2	1-1.4	3. 2-20
	4. Compression ratio		2.5-5.0							4. 2.2-3.0
	5. Mold (linear) shrinkage, in./in.	D955	0.006-0.022			0.008-0.015	0.005-0.015	0.008-0.015	0.008-0.012	5. 0.006-0.…
Mechanical	6. Tensile strength at break, p.s.i.	D638[b]	1000-3000	4500-7900	5500	3300-8400	4000-11,000	1500-6750	6000-7240	6. 5500-13,…
	7. Elongation at break, %	D638[b]	600-850	290-630	530	410-620	110-550	475-1000	340-425	7. <1
	8. Tensile yield strength, p.s.i.	D638[b]								8.
	9. Compressive strength (rupture or yield), p.s.i.	D695								9. 25,000-4…
	10. Flexural strength (rupture or yield), p.s.i.	D790								10. 10,000-1…
	11. Tensile modulus, 10^3 p.s.i.	D638[b]		0.33-1.45[c]	0.7[c]					11. 1000-150…
	12. Compressive modulus, 10^3 p.s.i.	D695								12.
	13. Flexural modulus, 10^3 p.s.i. 73° F.	D790	4-100							13. 1300-160…
	200° F.	D790								
	250° F.	D790								
	300° F.	D790								
	14. Izod impact, ft.-lb./in. of notch (⅛-in. thick specimen)	D256A	No break							14. 0.25-0.40
	15. Hardness Rockwell	D785								15. M110-120
	Shore/Barcol	D2240/ D2583	Shore A50-90	Shore A70-D54		Shore A55-95	Shore D46-78	Shore A70-92	Shore D55-75	
Thermal	16. Coef. of linear thermal expansion, 10^{-6} in./in./°C.	D696								16. 22-36
	17. Deflection temperature under flexural load, °F. 264 p.s.i.	D648								17. 260-290
	66 p.s.i.	D648								
	18. Thermal conductivity, 10^{-4} cal.-cm./sec.-cm.^{2}-°C.	C177								18. 7-10
Physical	19. Specific gravity	D792	0.9-1.2	1.19-1.22	1.11	1.17-1.25	1.15-1.28	1.10-1.20	1.14-1.21	19. 1.47-1.52
	20. Water absorption (⅛-in. thick specimen), % 24 hr.	D570	0.17-0.42				0.3			20. 0.4-0.8
	Saturation	D570								
	21. Dielectric strength (⅛-in. thick specimen), short time, v./mil	D149						470	470	21. 300-400
	Design and performance properties (see below)	SUPPLIERS[a]	Concept Polymer; Dow Chem.	Goodrich	Goodrich	**Upjohn;** Dainippon; Goodrich; Mobay; Ohio Rubber	**Upjohn;** Goodrich; Mobay; Ohio Rubber	**Upjohn;** Goodrich; Mobay; Ohio Rubber	**Upjohn;** Goodrich; Mobay; Ohio Rubber	Am. Cyanamid; Budd; MKB; Patent Plastics; Perstorp

Design and performance properties
For more detailed information on performance and design properties of plastics, by trade name and grade, see the following charts:

Chemical resistance .... p. 482
Dimensional stability .... p. 565
Electromagnetic shielding .... p. 556
Environmental stress-crack resistance ... p. 576
Fatigue .... p. 586
Optical properties .... p. 591
In the 1983-1984 edition of MPE, see:
Creep .... p. 512
Dielectric loss properties .... p. 533
Films .... p. 502
Foams .... p. 507
Impact resistance .... p. 564
Laminates, by NEMA grades .... p. 510
Outdoor exposure resistance .... p. 579
Poisson's ratio .... p. 592
In the 1981-1982 edition of MPE, see:
Flammability .... p. 564
Pipe .... p. 552
In the 1980-1981 edition of MPE, see:
Specifications/materials .... p. 597
Temperature index .... p. 632

a—Boldface listings identify advertisers in this issue. Where advertisements relate to the particular materials described, reference to the page number is included. See the Directory of Suppliers Classified Index, page 706, for additional suppliers of specialty materials and custom compounds.

b—Tensile test method varies with material: D638 is standard for thermoplastics; D6… rigid thermosetting plastics; D412 for elastomeric plastics; D882 for thin … sheeting.
c—Secant modulus at 100% elongation.

Urea	Vinyl polymers and copolymers								
			Polyvinyl chloride and polyvinyl chloride-acetate molding compounds, sheets, rods, and tubes			Molding and extrusion compounds			
	Alpha cellulose-filled	PVC molding compound, 15% glass fiber-reinforced	Rigid	Flexible, unfilled	Flexible, filled	Vinyl formal	Chlorinated polyvinyl chloride	Vinyl butyral, flexible	PVC/acrylic blends
1.	Thermoset								
		75-105	75-105	75-105	75-105	105	110	49	
2.	C: 275-350 I: 290-320 T: 270-300	I: 270-405	C: 285-400 I: 300-415	C: 285-350 I: 320-385	C: 285-350 I: 320-385	C: 300-350 I: 300-400	C: 350-400 I: 395-440 E: 360-415	C: 280-320 I: 250-340	I: 360-390 E: 390-410
3.	2-20	8-25	10-40	8-25	1-2	10-30	15-40	0.5-3	2-3
4.	2.2-3.0	1.6-2.2	2.0-2.3	2.0-2.3	2.0-2.3		1.5-2.5		2-2.5
5.	0.006-0.014	0.001	0.002-0.006	0.010-0.050	0.008-0.035 0.002-0.008(trans.)	0.001-0.003	0.003-0.007		0.003
6.	5500-13,000	9500	5900-7500	1500-3500	1000-3500	10,000-12,000	6800-9000	500-3000	6400-7000
7.	<1	2-3	40-80	200-450	200-400	5-20	4-65	150-450	35-100
8.			5900-6500				6000-8000		
9.	25,000-45,000	9000	8000-13,000	900-1700	1000-1800		9000-22,000		6800-8500
10.	10,000-18,000	13,500	10,000-16,000			17,000-18,000	14,500-17,000		10,300-11,000
11.	1000-1500	870	350-600			350-600	341-475		340-370
12.							335-600		
13.	1300-1600	750	300-500				380-450		350-380
14.	0.25-0.40	1.0	0.4-22	Varies over wide range	Varies over wide range	0.8-1.4	1.0-5.6	Varies over wide range	1-12
15.	M110-120	R118				M85	R117-122	A10-100	R106-110
			Shore D65-85	Shore A50-100	Shore A50-100				
16.	22-36		50-100	70-250		64	68-76		68-79
17.	260-290	155	140-170			150-170	202-234		167-185
		165	135-180				215-247		172-189
18.	7-10		3.5-5.0	3-4	3-4	3.7	3.3		
19.	1.47-1.52	1.54	1.30-1.58	1.16-1.35	1.3-1.7	1.2-1.4	1.49-1.58	1.05	1.26-1.35
20.	0.4-0.8	0.01	0.04-0.4	0.15-0.75	0.5-1.0	0.5-3.0	0.02-0.15	1.0-2.0	0.09-0.16
21.	300-400	600-800	350-500	300-400	250-300	490		350	480
	Am. Cyanamid; Budd; MKB; Patent Plastics; Perstorp	LNP; Thermofil	**Alpha Chem. (see ad, p. 95); Occidental; Union Carbide;** Air Products; Borden; Colorite; Conoco; Georgia-Pac.; Goodrich; Goodyear; Keysor-Century; Novatec; Pantasote; Stauffer; Tenneco	**Alpha Chem. (see ad, p. 95); Occidental; Schulman (see ad, p. 103); Union Carbide;** Air Products; Borden; Colorite; Conoco; Georgia-Pac.; Goodrich; Keysor-Century; Pantasote; Tenneco	**Alpha Chem. (see ad, p. 95); Occidental; Union Carbide;** Air Products; Borden; Colorite; Conoco; Georgia-Pac.; Goodrich; Keysor-Century; Pantasote; Stauffer; Tenneco	Monsanto	Goodrich	**Union Carbide;** Monsanto	**Sumitomo (see ad, p. 91)**